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ABSTRACT

This publication contains descriptions of "outstanding practices" in high schools that had the most success in improving student performance by doing the best job of implementing one particular High Schools That Work key practice. The 33 efforts are organized according to which of these 10 key practices they reflect: high expectations (4); vocational studies (6); academic studies (4); program of study (2); work-based learning (3); teachers working together (4); students actively engaged (4); guidance (1); extra help (3); and keeping score (2). Contact information is listed for each practice. Representative specific program topics are the following: (1) business and industry recognize students' high achievement; (2) school raises expectations to improve student achievement; (3) students excel in award-winning communication program; (4) 3-year program at an inner-city high school produces certified computer-systems engineers; (5) experiences in high tech manufacturing inspire geometry students to work harder; (6) writing across the curriculum as a strategy to improve student performance; (7) Oklahoma City students excel with help of six career clusters; (8) career clusters part of effort to boost graduation requirements; (9) teachers learn employers' expectations through workplace internships; (10) teachers make real-world assignments based on workplace experiences; (11) "home sweet home": an integrated community-service project; (12) rigorous senior projects bring real-world topics into focus; (13) student-produced magazine a good project for other schools; (14) project-based learning as a "way of life" at South Carolina high school; (15) PRIDE Days introduces students to education and career opportunities; (16) extra-help system makes higher standards accessible; (17) ninth-grade program helps students catch up to peers; (18) data point way to school improvement, recognition; and (19) findings by technical assistance team lead to successful school improvement. (YLB)

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HIGH SCHOOLS THAT WORK

SREB 1998 Outstanding Practices

Raising Student Achievement by Focusing on the 10 Key Practices

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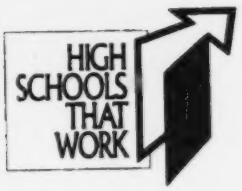

1998 Outstanding Practices

Raising Student Achievement by Focusing on the 10 Key Practices

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Key Practices

- **High expectations** — setting higher expectations and getting more students to meet them.
- **Vocational studies** — increasing access to intellectually challenging vocational and technical studies, with a major emphasis on using high-level mathematics, science, language arts and problem-solving skills in the modern workplace and in preparation for continued learning.
- **Academic studies** — increasing access to academic studies that teach the essential concepts from the college preparatory curriculum by encouraging students to use academic content and skills to address real-world projects and problems.
- **Program of study** — having students complete a challenging program of study with an upgraded academic core and a major.
- **Work-based learning** — giving students and their parents the choice of a system that integrates school-based and work-based learning. The system should span high school and postsecondary studies and should be planned by educators, employers and employees.
- **Teachers working together** — having an organization, structure and schedule giving academic and vocational teachers the time to plan and deliver integrated instruction aimed at teaching high-level academic and technical content.
- **Students actively engaged** — getting every student involved in rigorous and challenging learning.
- **Guidance** — involving each student and his or her parents in a guidance and advising system that ensures the completion of an accelerated program of study with an in-depth academic or vocational-technical major.
- **Extra help** — providing a structured system of extra help to enable students who may lack adequate preparation to complete an accelerated program of study that includes high-level academic and technical content.
- **Keeping score** — using student assessment and program evaluation data to improve continuously the school climate, organization, management, curricula and instruction to advance student learning and to recognize students who meet both curriculum and performance goals.

Raising student achievement by focusing on the *High Schools That Work* 10 key practices

By Gene Bottoms

The Southern Regional Education Board has assessed the reading, mathematics and science achievement of more than 80,000 students since the *High Schools That Work* initiative got under way in 1987. Consistently, the data have shown that high schools having the most success in improving student performance also are doing the best job of implementing the *High Schools That Work* key practices.

The key practices were created by a group of state leaders who asked the SREB to help high schools integrate academic and vocational studies and thereby raise the achievement of many "underserved" students. The practices have stood the test of time. They have served as a reliable framework for state and local leaders who want to improve school and classroom practices.

In this year's *Outstanding Practices,* we focus on school and classroom strategies that support the 10 key practices. In fact, we have organized the efforts according to the key practice they reflect. If your school faces a challenge in one or more of these areas, you will want to look under those key practices first. You also will want to communicate with the contact person or people listed for each practice to get details about how the school has achieved success. These contact people are eager to network with other schools that seek to make similar changes.

Schools implement the key practices at different times and in different ways, depending on their local needs and their site-specific plans for improvement. I hope you will read all of the "outstanding practices" and will refer to this book as your school implements the 10 key practices.

Gene Bottoms is senior vice president of the Southern Regional Education Board and founding director of High Schools That Work.

High Expectations

Business and industry recognize students' high achievement

Through the Arkansas Scholars Program, business and industry can recognize high school students who demonstrate the knowledge and skills needed in the workplace. More than 75 Arkansas school districts are involved in the program, which began in Independence County in 1994. Many school districts in Texas and Tennessee offer similar programs.

The program encourages academic achievement by students in grades nine through 12. Students first are introduced to the program in the second semester of eighth grade, when local business leaders come to school and deliver presentations about what businesses look for in employees, what salaries are paid for various jobs, and the importance of doing well in school.

The presentations give students a preview of life after high school. For example, a household budget based on an income of $1,500 per month is used to show students that it would be hard to make ends meet. The importance of a marketable skill and further education becomes clear.

Eighth-graders are asked to set the following goals for grades nine through 12:

- to make a C or above in all academic courses;
- to achieve an attendance record of 95 percent or better;
- to prepare for postsecondary education by taking a recommended curriculum of four English courses and at least three courses each in mathematics, science and social studies; and
- to complete high school in eight consecutive semesters.

Parents of eighth-graders receive information about the Arkansas Scholars Program criteria and are asked to support their children's academic efforts in the next four years.

Graduating seniors who achieve the goals are designated as Arkansas Scholars and are invited to a banquet or similar event at which awards are presented.

The program is making a difference. More students are taking advanced academic courses and are attending school regularly. Academic achievement is no longer the

exclusive domain of a few students. By taking more challenging courses and working to make good grades, students in the program are improving their chances of success in the workplace and in postsecondary education.

Cooperation is the key to the program. Leaders in business and education work together to deliver a clear message to students. Local employers agree to request high school transcripts and to recognize the Arkansas Scholars designation on applicants' school records.

The Arkansas Business and Education Alliance has adopted the program, which also is endorsed by the Arkansas State Chamber of Commerce and the Arkansas School Board Association.

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School raises expectations to improve student achievement

Administrators and teachers at Starkville High School in Starkville, Miss., have taken several steps in the last few years to raise standards and to get students to achieve at a higher level. Among the changes are the following:

- **Increased graduation requirements** — The school now requires 27 credits for graduation, five more than the state requires.
- **New courses** — Six Advanced Placement courses and courses such as electronics and a computer class have been added.
- **Block schedule** — The schedule gives teachers more time to work together and students opportunities to earn more high school credits.

- **Extended-day program** — The program gives students an extra period at the end of the day — from 3:30 to 4:30 p.m. Monday through Thursday — to make up work and receive tutoring from teachers and Mississippi State University students.
- **Yearlong pre-algebra and algebra courses** — These courses help students achieve challenging mathematics objectives.
- **Courses at colleges** — Students who have earned 23 credits by the beginning of grade 12 can enroll in academic and vocational courses at local colleges. Twenty-three Starkville seniors enrolled in East Mississippi Community College in 1998-99.
- **Amended vocational curriculum** — The high school has aligned its vocational curriculum with the requirements at East Mississippi Community College so that high school students can receive advanced placement credit for vocational/technical courses.
- **Technology** — Grant money was used to purchase a computer, a scanner, a digital camera and a printer for students in the English department to use.
- **Web page** — Students were encouraged to create the Mississippi Writers and Musicians Web page that features students' works.
- **Financial incentives** — The school and local merchants have arranged for eligible students to receive discounts. These students must achieve a high grade-point average, receive no demerits, and be involved in school and community activities.
- **Recognition of student work** — Students write reports weekly, and the principal reads portions of their work to the entire student body every day.
- **Blended academic and vocational studies** — Teachers have designed integrated projects combining physics and electronics; geometry and auto mechanics; English and marketing; algebra and drafting; physics and agricultural science; and medical terminology and Spanish.

In the wake of the higher standards, daily attendance has improved and scores on standardized tests, such as the ACT and the SAT, have increased steadily.

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Restructuring motivates students to reach new heights

A total-restructuring effort at Daviess County High School in Owensboro, Ky., has motivated students to stay in school and to meet high standards in academic and technical studies. As a result, the school has become a "model" for other Kentucky high schools — particularly in the areas of academy organization and guidance/advisement.

All students complete a rigorous academic core in grades nine and 10 and select one of six academies for grades 11 and 12. The academies are Mathematics/Science, Liberal Arts, Human Services and Wellness, Industrial and Agricultural Technology, Business, and Mass Communication/Fine and Performing Arts. The academy design adds meaning and focus to the 315 courses offered at Daviess County High School.

The general track has been eliminated; only college-preparatory-level and accelerated courses, including 20 Advanced Placement courses, are available.

To help students develop a program of study and select an academy, school leaders designed an "advocacy" program in which a teacher works with the same 20 students and their parents throughout high school. Teacher-advisers have access to students' grades, attendance records, discipline records and other information. If a problem arises, the teacher-adviser knows about it and can help the student solve it. Before the system was created, three counselors tried to meet the needs of more than 1,700 students.

Ninety-seven percent of parents meet with their children and teacher-advisers to plan or review a four-year program of study. When parents cannot come to the school, teachers visit students' homes by appointment during the week or on Sunday afternoons.

"We don't give parents an option," Principal Gary Keller said. "We expect them to participate."

In 1998, Kentucky funded Daviess County High School as a demonstration site to host a three-day visit by representatives of schools that wanted to learn more about academy structures, block schedules or teacher-adviser systems. The school was honored as a Kentucky Blue Ribbon School of Excellence in 1997-98. Scores on statewide tests for the Kentucky Instructional Results Information System (KIRIS) showed that Daviess County High School was the most-improved high school in the state in the 1994-96 biennium and the second-most-improved in 1996-98.

This recognition is based on the success the school has had in keeping students interested while raising their achievement. Attendance has improved, the dropout rate has declined, and the number of seniors who do not graduate has been cut almost in half.

In the 1998 *High Schools That Work* Assessment, Daviess County High School students surpassed the *HSTW* goals in all three areas — reading, mathematics and science. Reading scores rose from 267 in 1996 to 293 in 1998; mathematics scores increased from 295 in 1996 to 312 in 1998; and science scores grew from 283 in 1996 to 309 in 1998.

"Our students are no longer bored," Keller says. "We have added challenging courses that engage students and help them prepare for the future, no matter what they intend to do after graduation. Our expectations for students and parents are high."

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Revamped high school system links students to challenging academic and career studies

With about 2,100 students, Northrop High School is the largest of six comprehensive high schools in Indiana's Fort Wayne Community School System.

In 1993, Northrop leaders and teachers realized that the school must be restructured in order to give all students the opportunity to succeed in the workplace and further education. The system that these educators developed and implemented in 1995 has resulted in higher test scores, graduation rates and college enrollment. In addition, fewer students are being suspended from school and fewer are dropping out.

The new system, which emphasizes higher expectations and greater academic achievement for all students, is based on the *High Schools That Work* goals and key practices. It is characterized by a strong curriculum framework in which each student selects challenging academic and technical courses aligned with personal interests and career goals.

After Northrop High School developed its challenging academic and technical program of study, Fort Wayne Community Schools identified four broad areas that would be uniform districtwide. A student brochure was produced for each career area:

- business, marketing and customer service;

- engineering, manufacturing and science technologies;
- health, social, personal and public services; and
- performing and visual arts, design and media services.

To expand the concept, Northrop leaders organized a team for each career area. Each team comprised students, professionals in related career fields, representatives from area career centers, and Northrop teachers of English, mathematics, science, social studies and related technical areas. The teams were given time to meet during the school day to determine which courses offered at Northrop High School and Anthis Career Center would help students achieve education and career goals.

The *Course Description Handbook* for students describes each career area and identifies required and elective courses for each grade level. The handbook also contains information on postsecondary programs and related career opportunities.

All ninth-graders complete a semester-long course during which they learn to develop an education and career plan that is approved by their parents. The course also includes assessments of interests and aptitude, development of time-management and study skills, career exploration, and introduction to employers' expectations of workers.

Each student's education and career plan outlines what courses he or she will take in high school and postsecondary programs designed to strengthen knowledge and skills. The ninth-grade guidance counselor works closely with the five career-planning teachers to help students develop their programs of study.

Ninth-graders also take a course in word processing or computer technology. School leaders believe students need to be proficient in keyboarding, word processing, spreadsheets, databases and Windows technology to succeed in academic and technical classes and in the work force.

Only college-preparatory and honors courses are available in English, mathematics and science. In mathematics, all students complete college-preparatory algebra and geometry by the end of grade 10. Students are encouraged to take more-advanced mathematics courses in grades 11 and 12.

Northrop makes paid and unpaid internships available to all 12th-graders. Teacher-sponsors from all departments, the internship coordinator and intern-site mentors work together to ensure that students' tasks and activities are aligned with academic skills and competencies. Teacher-sponsors help the internship coordinator guide the unpaid interns. These teachers represent the career areas that the students are pursuing. For example, a biology teacher is a sponsor for a student serving an internship in a veterinary clinic.

According to results of the *High Schools That Work* Assessment, Northrop's actions are paying off. Between 1996 and 1998, students' scores increased from 277 to 294 in reading, from 295 to 311 in mathematics and from 287 to 305 in science. The 1998 scores exceed the *HSTW* goals. Forty-eight percent of students tested in 1998 qualified for the *HSTW* Award of Educational Achievement.

The percentage of students graduating from Northrop High School increased from 74 percent in 1994 to 92 percent in 1998. The percentage enrolling in college rose from 48 percent to 70 percent during the same period.

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Vocational Studies

Students excel in award-winning communication program

Students at Grady High School in midtown Atlanta have a unique opportunity to prepare for careers in mass communication. They produce award-winning newspapers and TV shows in a program supported enthusiastically by the community.

Grady High School enrolls 800 students in grades nine through 12. The student population is 70 percent black, 29 percent white and 1 percent "other." The school provides opportunities for students at all levels — the academically talented, the learning-disabled and the "average" student. In a society in which diversity often generates distrust and fear, Grady values the racial, economic and academic differences of its students and promotes an atmosphere of mutual respect and friendship.

The Grady communication program has grown from 17 students in 1981 to 251 students in 1998. It is available to Atlanta residents and tuition-paying nonresidents. Students take a solid academic core and a concentration of courses in oral, written and visual communication.

Criteria for entering the program include:

- an average of B or better in English (language arts);
- a 2.5 grade-point average in core curriculum courses;
- scores on achievement tests at the 65th percentile or above;
- high performance on the eighth-grade Georgia Basic Skills Test in writing;
- good attendance and conduct;
- commitment to academic achievement; and
- parental approval and support.

Students and their parents sign a participation agreement that outlines the importance of maintaining good grades, conduct and attendance. Students are monitored closely in each grading period. Those who do not meet the requirements are put on probation for one semester; if they fail to meet the requirements by the end of the probationary period, they are not allowed to continue in the program. Students dropped

from the program can reapply after one year if their grades, conduct and attendance improve sufficiently.

Ninth-graders in the program take one semester of journalism (mass media), one semester of oral communication (choice of debate, public speaking or drama), and one semester of computer science. The 10th-grade courses include one semester of journalism (an overview of print and broadcast journalism) and one semester of art.

At the end of grade 10, students select a concentration for grades 11 and 12. The following choices are available: print journalism (major product: a newspaper), electronic publication design (major product: a yearbook), principles of publishing (major product: a literary magazine), broadcast journalism (major product: Grady News Network, a school news program), communicative arts (major product: an art portfolio), speech communication (major product: drama productions and the debate team), foreign language (major product: a performance-based project), and music (major product: performance-based competitions).

If students have room in their schedules, they take additional communication courses such as beginning photography, advanced photography and multimedia. The program requires students to take at least six communication courses and advanced English in grades nine through 12.

Second-semester seniors may apply for an internship. Typical work sites include television stations, radio stations, the mayor's office, BellSouth, elementary and middle schools, advertising and public relations agencies, and publication/communication offices for a variety of companies and fine arts groups. Job-shadowing experiences are part of the curriculum in the print and broadcast journalism classes.

A partnership between WPBA-TV (Atlanta's public broadcasting station) and the Grady communication program has been mutually beneficial. WPBA-TV donated state-of-the-art control-room equipment, two cameras and additional lighting for the school's video production studio. In addition to helping students learn the business, the equipment is used to produce "Mind Busters," a show for middle school students who need teachers' help with homework. The one-hour program is shown live on WPBA-TV and on cable Monday through Thursday; reruns are shown Fridays and Saturdays.

Twenty-one students from the Grady communication program fill the technical jobs associated with producing a live TV show that competes with other programming in the nation's 10th-largest television market. The technical jobs include audio technician, floor manager, graphics operator, tape operator, camera operator, phone screener and technical director.

The communication program excels in many areas:

- The first forensic team in Atlanta Public Schools was organized at Grady in 1983. Team members engage in debate, oration, extemporaneous speaking and dramatic events. In addition to competing against other public and private schools statewide and throughout the Southeast, Grady communication students have represented Georgia at national competitions since 1988. For the last six years, attorneys from a leading Atlanta law firm have worked with communication students in mock-trial competitions.
- Student publications (newspaper, literary magazine and yearbook), closed-circuit television programs and a TV news program ("Grady News Network") have earned top awards from the Georgia Scholastic Press Association.
- The school newspaper (The Southerner) has received national recognition from the National Scholastic Press Association, the Columbia Scholastic Press Association, the National Newspaper Association, and the Quill and Scroll Society, an international honor society for student journalists.
- Walsworth Publishing Co. has used Grady's yearbook, The Orator, as a national marketing sample since 1991. It was inducted into the publisher's Gallery of Excellence in 1995.
- Communication students have received awards from the School Art Symposium, the Piedmont Arts Festival, the National Art Honor Society, the Georgia Media Festival, the Congressional Art Exhibit, the Atlanta College of Art's drawing competition for high school students, and Kennesaw State University's annual exhibition of high school students' art.

The community generously supports the program. Grants from the Coca-Cola Co. and Atlanta Gas Light Co. enabled photography students to publish a book, Sweet Auburn, that documents life in a much-heralded section of downtown Atlanta. In fall 1998, through funds from Atlanta's High Museum of Art, an artist-in-residence worked with a group of communication students to produce a sculpture that was placed on the front lawn at Grady High School. The Atlanta College of Art provides scholarships for evening courses and a summer institute.

The communication program uses technology in a number of ways to increase learning:

- Students use two Macintosh computer labs to produce publications.
- The Georgia Statewide Academic and Medical System (GSAMS) enables students to participate in interactive audiovisual conferences. For example, Grady was the

only high school that participated in a media forum sponsored by Georgia State University and CNN.

- Students use the school's closed-circuit TV system to transmit a weekly news program, "Grady News Network," to all students and teachers during homeroom periods.
- Orchestra students use computer equipment to produce their own CDs.
- Students in advanced video classes use digital equipment to learn modern editing techniques.

At a school named for Henry W. Grady, former editor of The Atlanta Constitution and "spokesman for the New South," high school students are learning the academic and technical skills needed to follow in his footsteps.

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Three-year program at inner-city high school produces certified computer-systems engineers

Howard High School of Technology, an inner-city vocational/technical school in Wilmington, Del., was the first U.S. high school to offer a comprehensive three-year program of study that prepares students to become computer network engineers and technicians. In 1998, the program produced the nation's first teenage Microsoft Certified Systems Engineer (MCSE).

Students typically begin the program in grade 10. However, two students began as ninth-graders in 1998-99, and 12 ninth-graders will enter the program in 1999-2000.

The challenging curriculum is based on software courses usually offered in postsecondary and industrial settings. Students in the computer systems engineer and technical support program attend a half-day of academic classes and a half-day of computer classes five days a week. Three fully equipped computer labs at the school are reserved for use by students in the program.

In addition to the Microsoft curriculum, Howard High School provides A+ Certification, a brand-neutral hardware and software program. The school plans to offer Cisco and Ortronics courses in the future.

Students also may study to become technical support specialists. To complete this program, which was introduced in 1998-99, students must pass three Microsoft Office User Specialist (MOUS) exams — Word 97, Excel 97 and PowerPoint 97 — in the first year; become A+ Certified in the second year; and complete an additional certification (Windows NT Workstation, for example) in the third year.

Sixteen students have enrolled in the program to train technical support specialists. They spend at least three class periods per day learning software basics and completing projects that apply to real-life situations. They also prepare PowerPoint presentations based on information they obtain from magazines and the Internet.

Work-based learning is integral to the program. Beginning in grade 11, students work as interns at a local bank one week out of every three weeks. Seniors spend half of every school day in work-study experiences that complement regular classes and enable students to practice teamwork and to solve real-life problems.

The program's mentoring component is one reason for its success. Each student is assigned a mentor to guide and direct the learning process.

The program has grown from 19 students in 1996-97 to 50 students in 1998-99. The school plans to expand the program to a total of 90 students in Levels 1, 2 and 3 by September 2000. Students in the program are expected to maintain a minimum 3.0 grade-point average and complete the required testing for each level.

To apply for the program, students must obtain two letters of recommendation, interview with computer instructors, and take a test to determine their knowledge of computers. Grade-point averages and school attendance also are considered.

Other high schools will be interested in the following facts about the program:

- Five students have earned the MCSE credential.
- Twenty-one students have earned the Microsoft Certified Professional (MCP) designation.
- Several graduates have accepted high-paying jobs.
- Graduates have been offered full and partial scholarships to colleges.

Howard's program has received national acclaim. Microsoft features the program in its national promotional video and in brochures for its training program. Newsweek

magazine featured the program in December 1997. Microsoft CEO Bill Gates uses Howard's program as an example of a successful partnership between his company and education.

Thousands of jobs become available each year for certified computer specialists. While school leaders are flattered by the national recognition, they are most proud that the program has opened doors for inner-city youths.

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Students work independently, cooperatively in award-winning technology lab

Stephenson High School in suburban DeKalb County (east of Atlanta) offers a modern technology lab where students work independently on self-paced units and cooperatively on whole-class projects. The program is flexible enough to meet individual students' needs and structured enough to meet state and national technology standards. In 1999 the International Technology Education Association honored Stephenson's program as a "program of excellence."

All program activities emphasize reading comprehension, writing, problem-solving, critical thinking, mathematics and science. When students enter the program, they are asked to establish goals related to education, career, income and personal fulfillment. This information helps the teacher advise each student and tailor the instruction to meet his or her needs.

Students select from nine classes in four areas of concentration.

- There are three courses related to design and planning: technical drafting (grades nine through 12), architectural drafting (grades 10 through 12) and pre-engineering (grades 11 and 12). Technical drafting includes problem-solving assignments using traditional techniques as well as computer-aided drafting software. Students in the architectural drafting course study the design of commercial buildings and houses. Pre-engineering students complete courses in drafting, electronics and materials pro-

cessing prior to enrollment. All students in the design and planning concentration have been involved in designing an outdoor classroom center to be used by the science department and other departments. The design required research, measurements, drawings, land surveys and knowledge of construction techniques. The drawings were included with an application for funding and will be used in completing the project.

- In the communication technology and graphic arts area of concentration, students design and print school-related publications and materials such as attendance forms, graduation programs, PTA information, brochures and tickets. They also work on video productions.
- Electronic communication and electronics students study the basic theories and principles of electricity. They use computer-aided instructional programs to reinforce the basic principles. Using computer software, students design and test electrical circuits. They also work with radio equipment, telecommunications, fiber optics and lasers during experiments in the lab.
- Materials processing, manufacturing and construction courses are taught in the materials production lab. Students use hand tools, machine tools and computer numerical controlled (CNC) machines to build objects or prototypes of wood, metal and plastic. The class is organized into a "company" with "stockholders, a board of directors, a CEO, managers, technicians and production workers." Students rotate through these jobs during the course, and the teacher serves as a technical adviser. For a final project, students produce an object in a totally automated production line.

Each work station in the technology lab has access to a computer, a printer and related hardware. Students use computer software such as Microsoft Office, Georgia Career Information System Data, desktop publishing, Electronic Workbench and AutoCAD. In addition to traditional instruction, they learn from written guides, videos and computer simulations.

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Tech Lab engineering class gets students to work harder, smarter

Summers High School in Hinton, W.Va., is getting career-bound students to work harder and learn more challenging content through its Tech Lab engineering class. The class has been adapted from the Foundations in Engineering course developed by the West Virginia Department of Education.

The 180-hour Tech Lab course emphasizes hands-on activities and the development of mental processes such as creative thinking, decision-making, critical thinking and problem-solving. It also focuses on using knowledge, materials and design techniques to solve everyday problems related to technology.

The lab contains 10 work stations, each of which is designated for a specific application: pneumatics, electronics, computer control, material testing, mechanisms, structures, engineering graphics, computer applications, desktop publishing, and integrating technologies.

There are three types of instruction:

- Teacher-directed activities — including lectures, instructions and guided activities — give students background for solving design problems.
- Student-directed work stations contain technological resources such as electronics, pneumatics, mechanisms and structural systems.
- The class is divided into engineering teams of four to five students who work together to solve various real-life technology-related problems.

Each engineering team researches a topic and prepares portfolios, displays, sketches, three-view drawings, models, technical reports and descriptions, speeches and a PowerPoint presentation. Team members then present their ideas to others through speeches, graphic presentations and multimedia presentations.

Students make presentations three times during the course. In the first six weeks, each student is videotaped while making a one-minute speech to the class. The students critique themselves by listing their strengths and weaknesses in making speeches.

During the second six weeks, the students make presentations based on their team projects. All teams are given the same scenario (problem to be solved) and are asked to solve a problem and create a model or system to present to the class. The length of the presentation depends on the number of students on the team — one minute per student.

The final presentation comes at the end of the third six-week period. Students incorporate what they have learned into a 10- to 20-minute presentation. This comprehensive project includes:

- a portfolio that includes a design brief, design specifications, sketches, three-view drawings, a technical description of a model or system, documentation and research;
- a display using a display board;
- a model or system; and
- a PowerPoint presentation that includes images (taken with a digital camera) of how their work has progressed.

The following example of a scenario (problem to be solved) and a design brief (assignment for solving the problem) is included by the West Virginia Department of Education in materials for the Foundations in Engineering course.

Scenario: Automover Inc. specializes in making powered chairs for the disabled. The units are designed to work efficiently on roads and sidewalks but are difficult or impossible to maneuver on uneven ground. Many users of these chairs would like to move about in areas that are not paved and might be bumpy and uneven.

Design brief: Design a new powered wheelchair that can be controlled easily but offers greater freedom for the driver, allowing the chair to climb over uneven ground and through gravel and rocky areas.

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Alliance between college, career center helps students make time count

Seventy-eight students at EHOVE Career Center in Milan, Ohio, and 15 students at Sandusky High School in Sandusky, Ohio, learn high-level technical skills while earning credit at both the career center and Firelands College of Bowling Green State University (BGSU).

EHOVE stands for Erie, Huron, Ottawa Vocational Education and refers to the three counties served by the center. Students earn an average of 20 semester hours of college credit, giving them a jump-start on an associate's degree or a bachelor's degree.

Introduced four years ago, engineering/industrial technology was the first of four programs in the initiative. Students in this program learn engineering through hands-on experiences with computer-aided design, electronics, manufacturing principles, quality assurance and manufacturing-process control. The program leads to an associate's degree in manufacturing, electronics or technical studies.

Three other programs have been added in the last three years: health technology; computer communication and networking technology; and hospitality and restaurant management technology.

Students entering the program must meet certain criteria regarding school attendance, grades, an interview, and college placement scores in mathematics, English and reading. Students who score well enough are placed in appropriate college-level courses.

These high school students attend college classes with traditional college students. They receive credit for courses such as electronics, manufacturing processes, medical terminology, computer software, biology, chemistry, physics, English and mathematics.

Recognizing the demand for skilled employees who can solve problems, work in teams, communicate and think critically, the career center required students in the initiative to take the Ford Academy of Manufacturing Sciences (FAMS) curriculum. The curriculum is offered in hands-on lab activities and is integrated into academic courses at the career center.

Local industries have supported the initiative by providing summer internships. Six students participated in six-week internships in 1998. They created computer-aided designs, stress-tested various metals, drew floor plans, and completed other projects based on skills they learned in one of the high school/college programs.

Students are assessed three times during a program. The Computer Adaptive Placement Assessment and Support System (COMPASS) is used as a pretest to place incoming 10th-graders in the proper English and mathematics courses. Students are tested again at the end of grades 11 and 12 to determine progress and to evaluate the curriculum.

The big winners in this program are the students, who receive high-level training while experiencing a college environment and taking advanced-level courses. After graduation, they can enter the work force, pursue a college degree, or both.

The program also benefits the community, which receives an increased number of highly skilled young people who are equipped for teamwork and problem-solving in business and industry.

Of the 18 students in the first graduating class in May 1997, 15 entered college, one entered military service, and two are working while planning to attend college. Without such a program, many of these students would not have gone to college.

In an informal survey, all students in the initiative said their interest in school has increased, their study skills have improved and they have a clearer idea of what they want to do in life. Most (82 percent) said their grades improved as a result of studying more challenging subject matter and gaining a better understanding of how mathematics and science are applied in the work force. Nearly all of them (99 percent) said their attendance and attitudes toward school improved.

Eighteen of the 22 students who will complete the program in 1999 will earn an average of 20 semester hours of college credit. Several will earn more than 25 hours.

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Tennessee high school students get university-level training in manufacturing

The Governor's School for Manufacturing — the only one of its kind in the nation — is a four-week university-level summer program for high school students in Tennessee. Career-bound and college-bound students who have completed grade 10 or 11 are chosen to attend the school.

Students focus on the engineering, technological and business strategies that govern advanced manufacturing. The program consists of four components that have been integrated to demonstrate how they affect one another in the manufacturing process:

- computing, mathematics and the Internet;
- English technical communication;
- the engineering and technology of manufacturing; and
- the business of manufacturing.

The school is funded by the state Department of Education, which pays all of students' expenses. The University of Tennessee at Knoxville provides the facilities for the four-week program, and the Oak Ridge National Laboratory and Y-12 Centers for Manufacturing Technology host the students for one week. Joe Iannelli, associate professor in the College of Engineering at the University of Tennessee at Knoxville, heads the program, which entered its fourth year in 1999.

Classroom activities teach students the key phases of efficient and cost-effective production of superior products. The program emphasizes computer skills, mathematics, and written and oral communication. Students are trained to use library resources to conduct research on key topics in manufacturing.

Students take field trips to some of Tennessee's leading companies, where they study the strategies that have made these companies successful. Leaders in manufacturing are invited to discuss current developments and issues. Students also complete a major project on the primary facets of running a manufacturing company.

Each student develops a home page to share his or her experiences in the program with students across the state and nation. These home pages are part of the Governor's School for Manufacturing Web site at www.engr.utk.edu/~gschool.

In 1998, a total of 30 students — 18 boys and 12 girls — attended from 26 Tennessee high schools.

Students' applications were ranked by six educators from the University of Tennessee at Knoxville. Each student received a composite ranking based on grade-point average, results on standardized tests, faculty recommendations, and three essays.

"By integrating the technological, engineering and business facets of manufacturing, the school dispels the notion that manufacturing is a 'production-line' career and raises students' awareness of the many careers available in contemporary manufacturing," Iannelli said. "Many students have chosen a college major in engineering as a result of the experience."

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Academic Studies

Experiences in high-tech manufacturing inspire geometry students to work harder

Geometry students at Nansemond River High School in Suffolk, Va., watch "experts" use geometry in a high-tech workplace, and then the students solve problems and write reports based on what they have observed. This "active" approach to learning has contributed to a dramatic increase in mathematics scores at this school, where a large percentage of the students are minorities.

In geometry class, students first learn to use precise measuring instruments, such as micrometers and calipers. They practice by accurately measuring the thickness of paper clips and sandwich bags to a tolerance of within one-thousandth of an inch. Students work in groups to prepare for teamwork in the workplace.

During a visit to Penn Engineering & Manufacturing Corp. — a local manufacturer — the students receive an orientation and a guided tour of the plant. They ask employees questions and gather information for problems they will solve when they return to school. Students work in groups to answer questions such as:

- What amount of raw materials (in rods) is needed to produce 50,000 connectors?
- What is the cost of raw materials to manufacture 50,000 pieces?
- How much waste material is produced in making 50,000 pieces? (What is the volume of the raw material? What is the volume of a finished piece?)
- How much scrap is produced in manufacturing 1 million pieces per day? How many days will it take to fill the company's garbage container?

Each student writes a report on what he or she observed at Penn Engineering & Manufacturing. English teachers at the school developed a writing and editing worksheet that gives the requirements for the report and contains a checklist for elements such as focus, content, unity, organization and coherence. A proofreading checklist asks: "Have I eliminated fragmented, run-on and rambling sentences? Have I checked conjunctions for effectiveness and clarity?"

Journalism students tell parents and community members about this project by writing a script and producing a video that is shown on local cable TV. Students in world geography classes research the source and availability of raw materials and determine how recycling will affect the community.

Geometry students' grades on the project are based on:

- the degree of accuracy in using micrometers and calipers;
- the content, unity and technical preparation of written reports; and
- the accuracy and thoroughness of problems solved.

Students have said they were impressed by the use of high-tech equipment in the workplace and have asked the school to upgrade its equipment. They were intrigued by the company's recycling operation, including a machine that separates scrap metals. They also were interested in a system used to collect, treat and reuse oils from the manufacturing process.

Geometry classes offer this project and many others throughout the year. These hands-on experiences increase students' awareness of the need for high-level academic and technical skills to obtain jobs in modern manufacturing facilities. Enrollment in mathematics analysis (precalculus) and calculus classes has grown so much that the school has added another section of calculus. The number of sections of geometry has increased from five in 1990 to eight in 1999.

Students' average score on the mathematics portion of the *High Schools That Work* Assessment increased from 237 in 1996 to 287 in 1998. The percentage of students completing the *HSTW*-recommended curriculum of three high-level mathematics courses increased from 26 percent in 1996 to 56 percent in 1998. Enrollment in upper-level mathematics courses has increased, and 66 percent of students take a mathematics course in their senior year.

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Writing across the curriculum: A strategy to improve student performance

The faculty at Blackstone Valley Regional Vocational Technical High School in Upton, Mass., were looking for a way to raise the achievement levels of the 950 full-time students in grades nine through 12. Their decision was to incorporate writing throughout the curriculum to raise student performance, and the move has had several positive effects.

The strategy has given teachers many opportunities to integrate academic and vocational studies, and it has fostered good teaching practices. The most important effect of the increased emphasis on writing, though, has been the improvement in students' critical-thinking and writing skills.

The initiative is based on three premises:

- Students need to write more often to reinforce communication skills taught in English classes. Their best writing needs to be expected in every class.
- Teachers need to feel "ownership" of any initiative that calls for a major revision of instructional methods.
- Writing helps students gain a deeper understanding of academic and technical content.

After a careful search, teachers in the English department decided to adopt the Focus Correction Writing Management System developed by the Center for Effective Communication. The program includes professional-development activities and "areas of performance" for each grade level.

The "areas of performance" are the backbone of the program. Students are expected to concentrate on several "areas" of good writing at each grade level. New "areas" are added each year.

Examples include:

- **Grade nine** — Begin a new paragraph for each major idea.
- **Grade 10** — Make sure the tone is appropriate for the purpose and the audience.
- **Grade 11** — Use transitional sentences between paragraphs for clarity.
- **Grade 12** — Develop ideas in proportion to their importance.

All academic and vocational teachers are aware of the skills being taught in English and can design writing assignments that require students to demonstrate these skills. Point values are assigned to each "area" to help teachers grade their students' written work.

Short writing assignments enable teachers in academic and career courses to gauge whether students understand the concepts and skills being taught. Longer assignments help students see the "big picture" of how two or more subjects relate to one another.

In one integrated writing project, students took detailed notes on a procedure in a vocational/technical lab. They revised the notes in English class and used word processing software to enter them into a computer in the school's computer lab. An English teacher checked the notes for grammar and composition, and a vocational/technical instructor reviewed them for accuracy.

Students in auto-body classes were assigned nine writing projects to heighten their career awareness. They conducted research and wrote reports on the auto-body industry.

The schoolwide emphasis on writing is reflected in student achievement at Blackstone Valley. In 1997-98, the school placed second among 24 vocational/technical high schools statewide in the Massachusetts Comprehensive Assessment System. This assessment requires written, open-response answers to questions in all subjects, even mathematics. The Blackstone Valley students excelled because they were accustomed to explaining things in writing.

The average scores of Blackstone Valley students participating in the *High Schools That Work* Assessment in 1998 exceeded the *HSTW* goals in reading, mathematics and science. Scores in all three areas had risen since 1996.

In addition, 98 percent of Blackstone Valley students who took the 1998 assessment said they completed one- to three-page writing assignments that were graded. This percentage was higher than the percentage of students at high-achieving *HSTW* sites who said they did so.

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Senior projects combine science, technology knowledge

All students at Minuteman Regional High School in Lexington, Mass., are encouraged to complete a senior project that integrates science and technology. However, a senior project is a requirement in many technical areas. This four-year process results in a group of youths who learn independently and are better prepared for work and further education.

Each project must solve a problem; contribute to a vocational/technical area or to the community; or be significant to a specific vocational/technical area, the local community, or the scientific and technical community.

Each project includes four key components:

- **Process** — a proposal, a log book in which the student records his or her activities, teacher verification that the student has learned required skills, and time lines.
- **Research** — a research paper, source documentation, interviews, and internship and job-shadowing experiences.
- **Product/performance** — a product, a performance or a project that adds value to the student, the school or the community.
- **Presentation** — an oral presentation with visuals before a committee of parents, teachers, a mentor or other representative of business and industry, and other adults invited by the student. After the presentation, committee members ask the student questions about the project.

The project begins in ninth grade, when students choose a topic and gather information on it. They learn how to conduct research and how to write a research paper, using a comprehensive guide compiled by the school faculty. The guide describes each step in writing a paper, from choosing a topic to preparing a "works cited" page.

Tenth-graders work on their research papers (expanding, deleting, updating) and begin working on their projects or performances and their oral presentations.

The projects begin to take shape in grade 11. Students select a project title, a hypothesis and a testing method, a project design, materials and equipment. They analyze data and make entries in their log books.

With the help of teachers and other adult advisers, 12th-graders develop and present their projects. In doing so, they demonstrate that they have mastered the academic and technical skills required of students in specific vocational/technical areas. Students must show that their knowledge, skills and work habits have improved and that they can apply the skills in real-world situations.

A 32-page booklet for students contains a proposal checklist, progress report forms, project approval and grading formats, committee member guidelines, oral presentation guidelines, exhibition checklists, and measures for judging project components. For example, the measures for evaluating a product or a performance are the following:

- ☐ The topic is worthy of pursuit; it answers a question, solves a problem, or addresses a student, school or community need.
- ☐ The product or performance demonstrates a clear understanding and an application of the academic skills needed for employment.
- ☐ The product or performance demonstrates the student's ability to create, produce or perform at a high level of quality.
- ☐ The product or performance shows the student's ability to solve problems.
- ☐ The product or performance shows the student's ability to think deeply about a significant issue.
- ☐ The product or performance shows the student's ability to organize, plan and carry out a plan.

Successful senior projects have included "Unraveling the Mystery of CAT Scans," "Macro Invertebrates and Stream Quality," "Forensic Pathology," "The Nitrates and Amino Acids of the Venus' Flytrap," "A Barrier-Free Home for the Handicapped" and "Jet Propulsion." After completing challenging projects, many Minuteman students have majored in mathematics or engineering at first-class postsecondary institutions and have entered technical/scientific careers.

Some Minuteman projects have received recognition in state and international competition. Minuteman students received several awards at the 1998 state science fair at the Massachusetts Institute of Technology. A Minuteman student received an award at an international competition in Dallas.

At various competitions, bowls and science fairs, Minuteman students have won $1,000 to $10,000 in cash prizes to be used for postsecondary study. Some have won first-year tuition waivers for certain schools.

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Technical school sets pace for students working on required senior projects

Delaware County Technical School–Folcroft in Folcroft, Pa., became a comprehensive high school in 1997, but most of its students still come from more than 20 schools in the county to enroll in half-day vocational/technical courses.

For the last three years, all seniors at the technical school have been required to complete a senior project, which consists of a research paper, a related project and an oral presentation. Each senior earns a first-semester exam grade for the paper and a second-semester exam grade for the project and presentation.

To help students from so many different schools meet high standards on their research papers, the principal and a group of academic and vocational teachers at the technical school developed a "pacing chart" for students' first-semester activities. The pacing chart first was used in 1998-99. "We believe that the process is as important as the product," Principal Dawn Grzadzinski said.

The pacing chart lists the tasks to be completed in writing a paper, the due date for each task, the teacher or teachers who will guide that part of the process, the possible points for each task and the actual points earned. There is space on the chart for teachers to initial when they have reviewed the tasks. The time line extends from September to January.

Senior Project Pacing Chart

Task	Due Date	Teacher	Possible Points	Earned Points	Initials
Topic	Sept. 22	Career	5	_____	_____
Note cards (25); minimum six sources	Oct. 23	Academic	10	_____	_____
Thesis statement/ formal outline	Oct. 30	Academic	10	_____	_____
Cover	Nov. 6	Technical lab	4	_____	_____
First draft	Nov. 20	Academic	8	_____	_____
Review	Dec. 11	Career and academic	10	_____	_____
Bibliography	Dec. 18	Academic	5	_____	_____
Final paper	Jan. 8	Career and academic	48	_____	_____
TOTAL			100	_____	_____

Rubric for Grading Senior-Project Research Papers

	4	3	2	1
Content	Information accurate; well-documented	Information accurate; most information documented	Some inaccuracies; lacks documentation	Inaccurate; poorly documented
Topic	Contains a thoughtful, well-developed thesis that demonstrates an understanding of the topic	Contains a clearly worded thesis statement that relates to the topic	Contains a stated thesis statement that generally relates to the topic	Contains no thesis statement, or thesis statement is illogical, incorrect and/or not comprehensible
Organization	Demonstrates unity with a smooth progression of ideas	Demonstrates an orderly flow of ideas with only a few lapses	Attempts to present ideas in an orderly way, but at times is disorganized	Has no discernible order
Language	Contains varied and structurally correct sentences that flow smoothly; uses sophisticated vocabulary and demonstrates correct usage and mechanics	Contains varied and structurally correct sentences; uses specific vocabulary and demonstrates correct usage and mechanics with some lapses	Contains primarily correct sentences with some variety; uses adequate vocabulary but may contain incorrect usage and mechanics that may distract the reader	Contains many errors in the following: sentence structure, vocabulary, usage and mechanics; errors may interfere with intended meaning
Score				

Total = Score _____ x 3 = _____ (Final Grade on Research Paper)

Teachers at the technical school created a series of training sessions to help students improve their writing skills. The sessions orient students to the senior project and focus on each step in the process, including how to select a topic, develop a thesis statement, and write and edit a paper. Students also review examples of "model" research papers.

Topics of senior projects are displayed on a bulletin board so that students, teachers and visitors will know what the seniors are working on. Teachers volunteer to assist students or to evaluate papers that interest them.

Teachers use a special set of standards, or rubric, to assign a final grade to each paper. The grade is based on a total of 48 points for four aspects of a paper: content, topic, organization and language. "We make sure our teachers know how to use the rubric and understand their role in the process," Grzadzinski said.

Partly because of the steps that students follow in writing research papers, the quality of the papers has improved and more students are meeting the end-of-semester deadline. The process has provided insights into the structured nature of research and has taught students that they can't just write something "off the tops of their heads."

"We compared students' papers from last year with those turned in this year and found that the best papers met approximately the same standards both years," Grzadzinski said. "However, the papers in the middle range between the best and the worst had improved substantially in length, structure and writing as a result of this process."

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Program of Study

Oklahoma City students excel with help of six career clusters

The approximately 1,800 students at Putnam City High School in Oklahoma City, Okla., can select from six career clusters that require a college-preparatory academic core and a major. The clusters and the years they were introduced are health (1996-97), engineering (1996-97), business (1997-98), fine arts (1997-98), natural science (1998-99) and social science (1998-99).

The cluster program begins in grade eight, when each student meets with his or her parents and an adviser for a career-planning session. The parents learn about graduation requirements, career majors and postsecondary options. Eighth-graders take tests to determine their interests and skills, and results help them identify a career major and the necessary academic and career courses.

Students who choose a career cluster must take four English courses and at least three courses each in mathematics, science and social studies, all at the college-preparatory level.

In 1998-99, there were 239 students in the health cluster. As the oldest and largest of the six clusters, it exemplifies the high level of commitment that teachers, parents and the community can have toward the cluster approach.

Students in the health cluster take a health-careers orientation course in ninth grade and health-related electives in ninth and 10th grades. In grade 11, students majoring in the health field may choose to do one of three things: enroll in a health laboratory and a medical terminology class at the high school; take a sports medicine course at the high school; or earn four credits per year in courses taught at Francis Tuttle Area Vocational Technical Center.

Students in grade 12 may continue to spend half of each day in classes at Francis Tuttle, continue with the sports medicine program at the high school, or participate in a program that matches students with mentors at local health facilities.

Students in the health cluster can apply to attend a two- to three-day summer "camp," during which they participate in tours and activities at health-related sites, such as a rehabilitation center or an organ transplant program.

The English, mathematics, science and social studies teachers who volunteered for the health cluster team attended special training sessions to learn to rewrite the academic curriculum. They also participated in teacher internships with staff at Integris Baptist Medical Center, a strong supporter of the health cluster. As a result, teachers incorporated health-related problems and examples into each academic discipline.

Counselors also increased their understanding of the health field. They participated in industry internships and spent time with advisers from the technical center and community colleges to learn about students' options for postsecondary study.

The cluster approach is working at Putnam City High School. Among students in the six clusters, the attendance rate improved and the number of suspensions declined in three years.

No student in the health cluster has dropped out of school in the last four years, compared with a 10 percent dropout rate for the school's general population. Students in the health cluster typically exceed graduation requirements by taking extra mathematics and science courses. These students experience firsthand the need for mathematics and science in the health field. Their teachers and health professionals encourage these students to meet higher expectations.

Students take the ACT EXPLORE test in eighth grade and the ACT PLAN test in 10th grade. These assessments, which are correlated with the ACT test for college entrance, are used to identify whether students are advancing academically and whether they remain committed to their clusters.

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Career clusters part of effort to boost graduation requirements

Beginning with the Class of 2002, students at Queen Anne's County High School in Maryland will complete a challenging academic core and a career major. They also will be required to complete 26 total credits for graduation.

The academic core meets the state requirement that every student complete 16 credits in college-preparatory-level academic courses, including four credits in high-level English, three credits in mathematics courses starting with Algebra I, and three credits in science. The other credits are in social studies, health and physical education, fine arts, and technology.

A focus group of faculty members researched programs of study and chose the career cluster model. The entire faculty approved the model, and the Board of Education enacted it.

The five career clusters are:

- arts and communications;
- biological, environmental and natural resources technology;
- business management systems;
- engineering, mechanical and construction technology; and
- health and human services.

The five career clusters are based on a study of career opportunities available in business and industry in the region. The clusters were organized from vocational and technical courses already offered at the school. Each cluster contains four to seven career options.

To expand students' access to quality programs, the high school has formed a partnership with Chesapeake College (a local community college) to allow students to enroll in career programs that are not offered at the high school. Through dual enrollment, students can pursue specific areas of interest, such as paralegal studies, criminal justice, tourism/hospitality and manufacturing. They receive a 50 percent discount on tuition and college credit toward an advanced degree or industry certification.

Students who participated in the *High Schools That Work* Assessment at Queen Anne's County High School in 1998 exceeded the *HSTW* goals in all three areas: reading, mathematics and science. Ninety percent of these students said they talked with a

parent or guardian about planning a high school program of study. This percentage had increased from 81 percent in 1996. Parents apparently are becoming more aware of the need for students to complete a challenging program of study.

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Work-based Learning

Teachers learn employers' expectations through workplace internships

Franklin County Career & Technology Center, a high-achieving *High Schools That Work* site in Franklin County, Pa., was one of eight schools in the district that participated in a summer internship program that placed teachers in the workplace. Academic and vocational teachers, administrators and counselors took part in the six-day event at various local businesses.

These educators saw firsthand the mathematics, science and communication skills needed in the workplace, and they learned how to relate academic skills to real-life situations. Although job experiences differed from company to company, each internship emphasized workplace skills such as teamwork and responsibility.

Participating teachers incorporated their new knowledge into lesson plans that reflected workplace activities and requirements. They also discussed their work-site experiences and lessons they learned with the school district's curriculum specialists and administrators responsible for curriculum content.

Participating teachers received a $400 stipend. Business mentors met with them at the beginning of the summer to focus on the nature of a high-performance workplace, the importance of teamwork, and ways to integrate workplace experiences into classrooms.

Educators were enthusiastic about what they learned. During the internship, they recorded work-related activities in journals to be used in reinforcing academic and technical skills.

After the internship, the participants attended a session to reflect on the experience, discuss business trends that affect education, and work on curriculum and instructional strategies. In written evaluations, they explained how they would change their approach in the classroom based on the experience and how they would share the experience with other teachers, administrators, school board members and parents.

As a result of hearing from their teachers about the skills needed in the workplace, students have been motivated to take higher-level academic courses, particularly in computer-related subjects.

Because of positive response, the program will be expanded to include more teachers. The program is coordinated by the Franklin County School-to-Work Partnership, a group of representatives of business, industry, government and education who volunteer to connect the worlds of work and education.

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Teachers make real-world assignments based on workplace experiences

An increasing percentage of teachers at Moody High School in Corpus Christi, Texas, are making real-world assignments as a result of their experiences in business and industry. English teachers ask students to write about career fields; mathematics teachers emphasize the algebra and geometry needed in workplace situations; and science teachers connect biology, chemistry and physics with health care.

For the last two years, many of the school's 130 teachers spent one day in November in the workplace. They observed, asked questions, took notes and began planning what they would do when they returned to the classroom.

These "teacher externships" are designed to expose teachers to information that can be used in activities that prepare students for the future. For example, a mathematics teacher learned that real estate attorneys need to know geometry and other mathematics concepts to deal with maps, property boundaries, sales costs and interest rates. She asked her students to solve several real-life mathematics problems associated with selling a home.

The school's staff-development coordinator prepared an externship guide that outlines the benefits to teachers, students and employers; a plan for a successful teacher externship; a check list for the experience; questions to ask employers; and a lesson plan format. The lesson plan format makes it easier for teachers to design classroom activities based on what they have learned in the workplace. It provides space for them to list materials, content, background information, objectives, needed preparation, a procedure, and ways to evaluate students.

Because teachers are responsible for finding their own "business partners" to visit, externships are personal and rewarding. Teachers are encouraged to ask questions about the skills and training required for a position, the business' use of new technologies, and the kind of instruction that will prepare students for future employment at the company.

Teachers return to school with an awareness of today's job market, instead of the job market they explored in their youth. More important, these teachers dedicate themselves to new ways of preparing students for work and further education. One teacher said: "We have been doing our students an injustice. Even a low-paying job requires skills that we have not been helping them acquire."

Another teacher summed up externships' impact on teachers and students: "After seeing the importance of written communication in the workplace, I gave my 11th-grade English students an opportunity to complete an assignment that integrated writing and career/technology studies. Students earned grades in both English and a career/technology course. It was the first time in 27 years of teaching that every student completed an assignment."

Eighty-two percent of the Moody High School students who participated in the 1998 *High Schools That Work* Assessment said their science teachers related science to the real world at least weekly. These students exceeded the *HSTW* science goal. In the same assessment, 73 percent of the students said their mathematics teachers related mathematics to real life, and they exceeded the *HSTW* mathematics goal.

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Students meet tough requirements in school-to-work program

Berks Career and Technology Center, near Reading in southeastern Pennsylvania, offers work-based learning designed to prepare students for 21st-century careers. The Partnership for Accelerated Career Training (PACT) is a seamless, four-year program developed by a team of vocational, academic and postsecondary teachers.

PACT links two years of high school with two years of postsecondary study. In Years 1 and 2 (grades 11 and 12), students earn credits toward an associate's degree or a postsecondary credential while working in a career field. In Years 3 and 4, they complete a postsecondary program at a college or technical school or complete a registered apprenticeship program in the workplace.

PACT offers seven career areas:

- automotive technology;
- culinary arts;
- electronic pre-press;
- heating, ventilating and air conditioning;
- industrial maintenance;
- machining and toolmaking; and
- painting and decorating.

Students in the program must demonstrate high levels of scholarship and personal responsibility. Qualifications include:

- a strong interest in a career field;
- a strong aptitude for a career field, as measured by an aptitude test;
- a college-prep or tech-prep program of study that includes challenging academic courses;
- a solid background in mathematics, as required by a career field;
- computer, reading and science skills, as required by a career field;
- regular attendance at school;
- two recommendations from teachers in mathematics, technology, physics or industrial arts;

- a recommendation from a school counselor; and
- good citizenship.

PACT students interact with trained mentors in the workplace. These mentors and the PACT work-based-learning coordinators track whether students are meeting the program's standards. Regardless of whether the PACT experience is paid or unpaid, employers contribute to a college tuition fund based on the number of hours a student works.

PACT students develop strong academic skills and gain a thorough understanding of the relationship between education and the "real world." They see firsthand the career opportunities within a business or industry.

A unique aspect of PACT is the opportunity for students to experience multiple job skills, both in school and at the work site.

For example, while attending the career center, students in the industrial-maintenance program learn skills in robotics; electronics; electricity; welding; plumbing; heating, ventilating and air conditioning; and machining/toolmaking.

At the work site, PACT students in the industrial-maintenance program perform various jobs. One student worked for a local utility company at a fossil-fuel power plant. The student rotated through several departments, including welding, machining, hydraulics and electronics.

Employers sign training agreements in which they describe what and how they will teach the students; what the students will be paid; the schedule of coursework and job activities the students will follow; and the responsibilities of the students, their parents, the school district and the employers. The employers agree to conform with all federal and state health and safety standards, to establish and maintain a grievance procedure for PACT students, and to meet other safeguards identified by the Pennsylvania Department of Education's Office of Vocational and Technical Education.

In the last four years, the program has grown from two to 26 students. The first class of students to complete the four-year program will graduate with associate's degrees in 1999.

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Teachers Working Together

'Home sweet home': An integrated community-service project

In performing some "Martha Stewart magic" on a local nursing home, a group of Alabama high school students learned about interior design, health care and business — as well as the mathematics, science and communication skills needed in these career areas.

Teams of students from Francis Marion High School and Marion Area Vocational Center in Marion, Ala., participated in the integrated learning project at Vaughan Perry Nursing Home. The students were enrolled in business education, health-care science and technology, apparel and home interiors, English, mathematics, science and social studies. They painted walls, applied wallpaper borders, hung pictures and curtains, and selected new bedspreads and accessories.

To get ready for the project, the students toured the facility, interviewed residents of the nursing home, and developed a design proposal and budget. They raised funds, purchased supplies and performed the work. The areas they decorated included patient rooms, hallways and the beauty salon.

Each team had a teacher and a community leader who advised the students as they made decisions about the project.

Students used a variety of technical resources, including a computer, a video camera, a 35mm camera, a calculator, a scanner, a TV/VCR and a digital camera. Each team used PowerPoint computer software to prepare a presentation on the project.

The work was judged by a committee of nursing home administrators. The top three teams received cash prizes. Teachers graded the students on the folders they kept during the project and on their PowerPoint presentations. Daily grades were awarded for participation in the project.

Nursing home personnel and patients were pleased with the quality of the students' work. The students learned to combine academic and technical skills in planning and carrying out a complex project that involved the school and the community. Teachers saw an increase in students' motivation, attendance, teamwork, responsibility and community awareness.

This project is an example of how a school can work with business and community leaders to provide authentic integrated-learning experiences for students.

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Rigorous senior projects bring real-world topics into focus

Twelfth-graders at South Laurel High School in London, Ky., address tough academic and technical topics as they complete senior projects required for graduation. Many projects reflect the high-tech world the students will enter after high school. Typical topics include "building a Web page" and "the pros and cons of using the Internet."

Each project consists of three phases: a research paper, a product and a presentation to a panel of judges. Students select mentors who are experienced in the topic to guide them during the year.

In Phase 1, students conduct research, interview experts, organize the information and write a report. This process involves real-world skills such as information-gathering, problem-solving, time management, self-discipline and persistence.

In Phase 2, students spend at least 15 hours outside of school developing a product or service that is the focal point of the project. Products have included an old-fashioned quilt, a play about a family that survived the Holocaust, and a book for teaching French to an 8-year-old child.

Phase 3 involves a six- to 10-minute oral presentation on the research paper and the product. Students must know their topics thoroughly and be prepared to answer questions from the judges.

Seven English teachers guide students through the senior project process. The project is part of Advanced Oral Communication and Research, an English course that also is required for graduation.

Three projects are described in more detail:

- One student who wanted to learn more about martial arts studied Shaolin Do. He researched and described the system from its origin to today. A martial arts instructor helped him gain insights into the physical and mental challenges required by this martial art.
- Working with the director of a children's home, one student planned activities for orphans. Her research paper addressed the history of children's homes. In addition, she began corresponding with children living in orphanages in other countries.
- Another student interviewed a Kentucky author for a research paper on successful writers. Her project was a children's book she wrote and illustrated.

Senior projects build students' communication, problem-solving, technical and critical-thinking skills, which are necessary for a successful transition to the adult world. They also give students an opportunity to showcase these skills.

South Laurel seniors who participated in the *High Schools That Work* Assessment in 1998 scored at the same reading level as college-preparatory students in the National Assessment of Educational Progress (NAEP) national sample. They also exceeded the *HSTW* reading goal by 24 points.

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Students put technology to work in designing, building nature trail

At Carlisle Area High School in Carlisle, Pa., a focus on combining vocational studies with academic subjects has had a visible effect: a nature trail designed and built by students.

Vocational/technical instructors at that high school work with mathematics and science teachers to promote a more challenging curriculum with emphasis on applications to real life. Unlike many integrated-learning efforts, this collaboration takes place every day throughout the school year.

The ongoing effort to blend academic and technical studies received a boost from the local School Board, which voted to support the equivalent of one full-time position at the high school. In this arrangement, a manufacturing technology instructor works with an applied mathematics teacher and a geometry teacher five half-days a week. A building-construction technology teacher works half of the school day with two geology/environmental science teachers.

The latter team of teachers led the nature trail project, which involved students in geology/environmental science classes. The building-construction technology teacher served as the students' "cyber-guide" during their initial research on the Internet. Using his knowledge of construction, he helped them weed through material on the World Wide Web to find useful ideas and information.

The students then designed the nature trail, collected materials, handled the construction and built objects to place along the trail. Using mathematics concepts, they scaled down plans for adult-size benches and created plans for smaller benches to fit the 3-year-olds who participate in the school's child-care instructional program.

When the hands-on work was completed, the students wrote reports for their English classes. These reports were printed both in the high school newspaper and in the local newspaper.

Students at Carlisle Area High School who participated in the 1998 *High Schools That Work* Assessment met the *HSTW* goal in mathematics and exceeded the goals in reading and science. Between 1996 and 1998, their average scores increased from 276 to 283 in reading, from 290 to 295 in mathematics, and from 290 to 294 in science.

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Business community backs 'spirit of curiosity' for students

The pioneering spirit that transformed El Dorado, Ark., into a progressive community is "alive and well" as local business and community leaders promote academic excellence in El Dorado Public Schools. Leading the effort is the nonprofit El Dorado Education Foundation, which awards mini-grants to teachers for innovative projects aimed at raising student achievement.

For the last two years, one such project has been "The Spirit of Curiosity: Renaissance Through the Ages," which involves community representatives and all students at El Dorado High School. Teachers at the high school received $5,000 for the 1999 project, which increased students' understanding of academic and technical subjects and how these subjects relate to each other and to real life.

The purpose of the project is to help students learn more about the Renaissance period and its influence on learning. Each subject taught at the high school has specific content that students should learn through the project.

The project culminates in the Renaissance Faire, a six-hour event featuring food and entertainment planned, prepared and presented by students. Students work in interdisciplinary groups to produce booths, costumes, posters, bulletin boards, illustrations, maps, fliers, news releases and public service announcements. Throughout the year, individual teachers assign student journals, essays and projects that support the theme.

In addition to the mini-grants, the foundation presents awards for "superior teaching" and is creating a permanent endowment to fund worthy school projects.

The president of the foundation's board of directors is also the president and CEO of Murphy Oil Co., a corporate partner of El Dorado High School. The company offers four cash awards to high school students in recognition of academic excellence. The awards are based on students' scores on Advanced Placement tests, the ACT and the SAT. The company hosts a reception to honor the award recipients.

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Students Actively Engaged

Student-produced magazine a good project for other schools

An outdoor-living magazine published by Haralson County High School students in Tallapoosa, Ga., is winning acclaim and dramatically improving students' writing skills.

HOWL (Haralson Outdoor Writing Lab) magazine is the only student-produced hunting and fishing magazine in the nation. The students interview experts, write and edit articles, take photos, sell advertising, use desktop publishing software to design and lay out the magazine, and handle all financial matters.

"These students take pride in a project that they really enjoy," said John Howle, the school's outdoor-writing instructor. "Our school is located in an area of Georgia where many kids drop out before they graduate. The magazine has made students want to come to school."

Many schools could adapt a magazine project by using a similar process and by selecting a topic — whether it be a sport or some other theme — that fits the community's interests. Participating students improve their reading, writing, use of computers and mathematical skills (through calculating circulation and profits).

Each issue of HOWL magazine contains more than 50 illustrated pages, is printed on glossy paper and features a four-color cover. Four issues are produced each year — one in each nine-week period. The magazine focuses on outdoor sports that are in season at the time of publication. For example, the fall 1998 issue contained articles on fishing, hunting, travel, equipment and wildlife management. Regular features include recipes, student artwork and reviews of books and videotapes.

Students who wish to be on the magazine staff — mostly career-bound students but also a few college-preparatory students — fill out an application and submit writing samples to be accepted. They are graded on the quality of their magazine articles and receive credit for an elective course.

Howle says the writing skills of magazine staff members improve dramatically. He looks at six categories of improvement: content, organization, style, sentence formations, tone/audience and mechanics. Students' attitudes toward writing also improve, and the magazine has motivated them to work harder and to achieve at a higher level.

To produce the magazine, the school has a computer, printer, scanner, digital camera, 35mm camera, tape recorder and phone. In addition to the start-up costs for this equipment, the class needs $1,700 per nine-week period to pay for phone bills, film, batteries and printing. These costs are offset by advertising revenue and subscription fees ($12 for four issues).

Outdoor-living organizations are paying attention to HOWL magazine. The Georgia Chapter of Safari Club International (SCI) contributed $1,500, and the Alabama Chapter of SCI gave $500 for equipment and production expenses. The National Wild Turkey Federation contributed $2,500 for computers. The Georgia Environmental Education Council awarded the school a grant to build an outdoor classroom and a wildlife observatory, where students, parents and teachers can learn about plant and wildlife habitats.

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Project-based learning a 'way of life' at S.C. high school

All students who choose to attend the Academy for the Arts, Science and Technology in Myrtle Beach, S.C., expect to spend much of their time completing challenging projects designed to advance academic and technical skills. The academy offers 10 concentrations, or "majors," and enrolls 320 students in grades 11 and 12 from six high schools.

Project-based learning is a "way of life" at the academy. Flexible scheduling gives students time to work on projects, with academic and vocational teachers serving as "coaches." Because the projects relate to what students plan to do after high school, students are willing to devote time and effort to doing a good job.

Four schoolwide projects are highly structured to ensure that students get the most from them. Each project requires research, a written report and an oral presentation. Students learn the specific criteria for the projects at the outset and know what they need to do to earn an A.

Students begin by submitting a written proposal of what they intend to accomplish in their projects. Academic and vocational teachers review the proposals and either accept them or mark them "not yet" and send them back for revisions. Teachers write notes and suggestions on the proposals to help the students make improvements.

Within the first few weeks after entering the academy, 11th-graders complete a research project. This project is intended to familiarize students with their chosen career fields; related fields; what it takes to enter and succeed in those fields; and what high school courses are needed to prepare for them. Students use computer graphics programs to prepare slides to support their findings.

Eleventh-graders also are required to devote at least 20 hours to participating in a community service project related to their majors.

Juniors and seniors engage in a "shadow" project for a midterm grade. In this project, students spend at least six hours with an employee in a certain career field. They document the skills needed for employment and relate these skills to their academic and vocational studies. They also use a computer to prepare graphs of what the professionals do.

Each 12th-grader works on a Senior Exhibition of Mastery, a yearlong project designed to combine a myriad of academic and technical skills. The exhibition demonstrates the student's growth in knowledge, skills and work habits and shows that he or she can apply the skills well across disciplines. Parents are asked to sign off on the projects, indicating that they understand what their children will be expected to complete during their senior year. Parents also are invited to join teachers, students and community representatives when their children present their oral reports in April or May before graduation.

Students complete various projects throughout the curriculum. For example, 11th-graders learn to use Internet search engines to find background information on artists, scientists or others who excelled in the students' career fields. These searches have turned up examples of Frank Lloyd Wright's architectural designs and lists of art books that should be added to the school library. Pre-engineering students build model bridges and other devices.

The project-based learning approach is paying off in improvements in student achievement. From the academy's opening in 1994 until 1997, the percentage of students attending a technical college increased from 28 percent to 39 percent and the percentage of students attending a four-year college or university increased from 32 percent to 43 percent.

Students who participated in the *High Schools That Work* Assessment met the *HSTW* goals in reading, mathematics and science in both 1996 and 1998. Over that two-year period, students' average scores increased from 282 to 295 in reading, from 303 to 318 in mathematics, and from 293 to 315 in science.

"Our students are doing projects in grades 11 and 12 that most young people don't do until they go to college," observed Robert Bell, the academy's guidance counselor. "They know how to find and use information to solve problems and are more familiar with the community and what it takes to succeed in a career field."

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HSTW follow-up study becomes a student project

Project-based learning plays a prominent role in marketing/computer information systems, a career concentration for students in grades nine through 12 at Tri-County Regional Vocational Technical High School in Franklin, Mass.

These students work on projects that they design, projects assigned by teachers, projects requested by school administrators and staff, and senior projects. Students have designed an electronic payroll system for a large department store and have developed an in-school bank. They find information on the Internet and create graphic presentations with PowerPoint software.

When school leaders asked marketing students to conduct the *High Schools That Work* student follow-up study, 12th-grader LeeAnn McKenna got the job. LeeAnn is a cooperative-education student who works in the office of a large construction company. She also helped design the school's Web page.

The follow-up study involved contacting 100 young people who participated in the *HSTW* Assessment of reading, mathematics and science as seniors in 1998. In the follow-up study the graduates are asked to describe their current situations (jobs, postsecondary education, the military, etc.) and to reflect on their high school experiences.

LeeAnn handled all aspects of the study, including doing a "mail merge" of graduates' addresses and recording the survey responses onto a disk provided by MPR Associates. She used Excel computer software to create a database of the graduates. She entered information on the graduates (names, addresses and phone numbers) as well as other information, such as the date the survey sheets were mailed, the date each one was returned, the dates of follow-up contacts, and whether the information was gathered by phone. This database enabled LeeAnn to give the *HSTW* site coordinator a daily status report on the survey.

To complete the project, LeeAnn analyzed the data and prepared a written report on the findings. She also made an oral presentation to the faculty on the results and their implications for improving student learning. As a result of this project, she was invited to participate in a workshop at the *High Schools That Work* Staff Development Conference.

LeeAnn says that the project helped her improve her computer skills and her ability to communicate, to organize tasks and to use time wisely. She says she likes project learning because "you remember what you learn, and you can work and learn at your own pace."

The message former students have been sending, which LeeAnn is passing along, is this: "I wish I had paid more attention to school. I didn't realize I wasn't learning enough until it was too late."

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State-of-the-art technology advances student learning

At Pahoa High and Intermediate School in Hawaii, all classrooms are networked, enabling students and teachers to communicate with one another, the school office and users of the World Wide Web. Students are taught to use computers as learning tools, focusing on the National Educational Technology Standards and the Hawaii Content and Performance Standards.

The school's Cisco Networking Academy is linked to Honolulu Community College and the services of Cisco Systems. Academy students are learning to install and troubleshoot local area networks and wide area networks. They also are wiring an elementary school in a neighboring school district.

Every classroom has at least one computer hooked up to the Internet. Students, teachers, parents and others from the community have access to two computer labs.

Students have developed a Web site (www.pahoahs.k12.hi.us) that contains course listings, tutorials to help students "surf" the Internet, and other information. Students maintain and update the site under the direction of the technology coordinator and teachers in the computer lab.

Seventh- and eighth-graders take a course that describes how technology is used in various settings. They learn to use computer software to develop displays for the science fair, presentations for research projects in social studies, and pieces for the literary magazine. These students also maintain a Web site for students in the middle grades.

Some of the projects for high school students include:

- creating digital art;
- using the Internet to contact students in other countries for foreign language and English as a Second Language classes;
- completing science projects;
- preparing lessons to be taught to elementary school students;
- completing research papers for business education classes;
- investigating topics for English literature classes (for example, finding background information on African-American history before reading the book *The Color Purple);* and
- maintaining the school Web site.

At-risk students use computer graphics to complete projects and to create presentations. They also use a variety of interactive software packages. An alternative-learning center helps at-risk students use computers to improve their mathematics and reading skills.

Students use the Internet to find information for research projects and class assignments in English and social studies classes. Teachers report that these students often read and write better than students who use traditional research methods.

All students, including at-risk students, can contribute essays and poems (that meet school standards) to the school literary magazine. Before the school acquired computers, 30 percent of students submitted essays or poems; between 60 percent and 75 percent now contribute. Students' pieces are placed on a computer server, where student editors and writers work together to produce the magazine. Such activities were difficult before the use of computers.

The school's network enables all students to access E-school, an electronic school operated by the Hawaii Department of Education. Classes are offered in several subjects, including space and cosmology, global studies, and the modern history of Hawaii. Teachers can take computer-related courses for professional-development credit.

Since the advent of computers, students have shown a renewed interest in education. Attendance has improved, and grade-point averages and SAT scores have risen.

The average scores of Pahoa students who participated in the *High Schools That Work* Assessment increased from 251 to 267 in reading, from 257 to 280 in mathematics and from 274 to 278 in science between 1996 and 1998.

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Guidance

PRIDE Days introduces students to education and career opportunities

PRIDE Days — an advisement activity that features business tours, guest speakers and service-learning projects — helps students at Owen Valley High School in Spencer, Ind., make informed decisions about work and further education. The event showcases career opportunities available in the community and helps students select and complete a career major.

Students participate in three days of activities during PRIDE (Patriots Responsible Individually for Developing Excellence) Days, which first were held in September 1998. Ninth-graders explore education and career options, while students from the upper grades learn what it takes to be successful in the workplace, higher education and/or the military.

The business community enthusiastically supports PRIDE Days. More than 50 local business and community leaders hosted tours, made presentations and organized service-learning projects. Eight organizations representing manufacturing, retail sales, health care and social services hosted tours for groups of students. The tours were many ninth-graders' first exposure to the workplace. Students listened as representatives of the host companies and agencies emphasized the connection between education and the workplace and described the knowledge and skills needed for various jobs. Business leaders representing the eight career concentrations that are offered at Owen Valley made presentations at the school. Meanwhile, postsecondary and business partners told upperclassmen how to select a college and how to get and keep a good job.

The third morning of PRIDE Days is dedicated to service-learning projects so that students "give something back to the community." Ninth-graders plan, organize and perform tasks on the school grounds, while upperclassmen assist civic organizations and county agencies.

PRIDE is a weekly resource period during which students meet with teacher-advisers as part of the school's guidance and advisement system. Teacher-advisers lead advisement sessions to help groups of 15 to 20 students set goals and select courses needed for a career concentration. The school's eight career concentrations are manufacturing, con-

struction and engineering technology; natural science and resources; social and personal services; arts, design and communications; business and management; education; government and legal services; and health services. Every student develops a four-year plan that includes high-level academic courses and elective courses that support a career area.

An advisement focus team — consisting of academic and vocational/technical teachers from all grade levels — plans advisement lessons for PRIDE. A subcommittee created and implemented the school's first PRIDE Days, including special lessons to help students prepare for the event. The team wants future PRIDE Days to include more active involvement by students.

"Students are capable of handling many of the arrangements, including contacting employers and inviting guest speakers," said Sue Cull, *High Schools That Work* site coordinator. "This event can become a good example of project-based learning."

PRIDE Days drew many positive comments. In a survey, teachers requested that the event be held annually. Students' responses also have been positive. Business leaders said they would be willing to participate in future PRIDE Days.

Owen Valley High School, the only high school in the county, has 920 students and is nestled in the hills and limestone deposits of rural southern Indiana. Owen Valley's school-improvement effort includes activities, such as PRIDE Days, that emphasize to students the importance of doing their best in high school.

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Extra Help

Extra-help system makes higher standards accessible

Page High School in Franklin, Tenn., developed a multifaceted extra-help system to assist students in meeting higher standards that resulted from implementing the *High Schools That Work* key practices. The system was built into the block schedule the school adopted five years ago.

The second period of each day, Monday through Thursday, is devoted to directed-study activities, including:

- remediation of skills needed for success in academic classes;
- continuation of instruction in current academic classes;
- enrichment opportunities; and
- career counseling.

The remediation component consists of proficiency classes in English and mathematics, learning labs to strengthen writing and mathematics skills, and reading classes.

In the continuation-of-instruction aspect of the program, students work on projects, practice their computer skills, participate in learning labs, do research in the library, and make up work missed because of absences.

Enrichment is designed to allow students who have done well in their studies to engage in independent study and to attend "credit classes" needed for graduation. Students also may take classes to prepare for the ACT, SAT and PSAT.

In career counseling, students maintain a Learning for Life portfolio that helps them review their skills, evaluate these skills and organize information related to their career goals.

Silent reading is encouraged during "directed study." If students have completed their work, they read newspapers and books or other materials assigned in English classes. A list of assignments and when they are due is posted for the "directed study" teachers.

Ninth-graders spend most of their time in a "freshman wing" of the school, where they can get accustomed to high school in a smaller setting. They also have special guide-

lines for their "directed study" activities. They spend the first 15 minutes reviewing proficiency objectives of Tennessee's high school competency tests.

Teachers in "directed study" serve as mentors to students who are assigned to it. These teachers see the students' study assignments and receive progress reports on the students every three weeks. Regular classroom teachers refer struggling students to the program.

The students at Page High School who participated in the 1998 *High Schools That Work* Assessment exceeded the *HSTW* goals in reading, mathematics and science. From 1996 to 1998, their average scores rose from 268 to 285 in reading, from 301 to 305 in mathematics, and from 289 to 296 in science.

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Ninth-grade program helps students catch up to peers

Although it is in a rural area, Garden City High School in Garden City, Kan., resembles many inner-city schools. Its student body of 2,000 in grades nine through 12 is 53 percent white and 42 percent Hispanic. Many students come from low-income families.

The school began a ninth-grade catch-up program to provide support in English, mathematics and science for freshmen whose skill levels are three to seven years behind those of average ninth-graders. Four teachers work with a total of 60 students.

Classrooms in the catch-up program are organized for high achievement. For example, the mathematics program consists of daily problem-solving, group investigations and individual activities. Students hear guest speakers, visit with their counselors and take field trips.

Instructors promote students' "sense of belonging" in a large high school setting through team-building exercises and group projects. Students respond positively to being able to choose their projects within a framework that is highly structured and achievement-oriented.

Students are referred into the program by eighth-grade teachers, parents or counselors. They attend a four-week "jump-start" school in August; during that time, teachers administer pretests and monitor behavior, attendance and work habits. Only students who behave, attend regularly and exhibit a desire to learn can continue in the program. Students enter the program as freshmen but may remain until their skills are strong enough for success in regular classes.

Test data show that students in this "school within a school" make substantial gains in mathematics and reading. Of all students who have entered the program in ninth grade, 100 percent have stayed in school for 10th grade and 76 percent have gone on to grade 11. The average attendance rate in the program is 98 percent.

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Florida school gives ninth-graders 'double dose' of academic studies

Fort Pierce Westwood STAR Magnet High School in Fort Pierce, Fla., has taken dramatic steps to combat the problem of too many students entering high school without adequate skills in reading and mathematics. In fact, 87 percent of students entering the school in 1997-98 did not read at grade level.

The school — a magnet school for science, technology and applied research — is in a rural community on Florida's east coast. More than half of the 1,500 students are minorities, and most students have jobs to help their families pay bills.

To help students succeed, school leaders decided to require every ninth- and 10th-grader to take two English courses and two mathematics courses. This "double dose" of academic subjects is made possible through the school's alternating-day block schedule. Every student in grades nine and 10 attends 88-minute English classes and mathematics classes every day instead of every other day.

The school has found that it is important for students in grades nine and 10 to receive daily instruction in English and mathematics in order to catch up and be able to do high school work. Parents and community members are supportive of the catch-up program.

Students in grades nine and 10 are placed in English and mathematics courses based on their performance on a pretest. Teachers developed the test during the summer, using Florida's Sunshine State Standards and state and national tests. If students don't do well in a certain course, they are moved (with parental permission) to a different course in which they can receive extra help.

To help students catch up with high school studies, the school has created a 20-minute daily period for enhanced instruction — a mentor program that involves all teachers and administrators. Each mentor is assigned a total of 15 students in grades nine through 12. Mentors work with the students on test-taking skills, behavior and attendance. The school's special-assignment administrator prepares packets of materials for the mentors to use in helping students.

Mentors help 11th-graders prepare to take Florida's High School Competency Test. They also call parents to let them know the importance of the test. As a result, students' average scores improved in 1997-98. The mentor program also has created beneficial relationships between mentors and students, who arrive early and stay late to receive guidance from these concerned adults.

Students do not receive credit or grades for the mentoring period. However, they participate actively. By having all staff — including the principal — lead mentoring sessions, the school sends the message that it cares about its students. As a result, students are working harder and placing more value on what they are being asked to do.

When the school converted to the block schedule six years ago, all teachers began receiving training in instructional methods that make course content more relevant to the workplace and that engage students more actively in learning. Teachers use these strategies routinely and ask students to redo work that does not meet high standards.

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Keeping Score

Data point way to school improvement, recognition

Rutherfordton-Spindale High School's use of data from *High Schools That Work* and other sources has brought dramatic changes in student achievement and has earned special recognition from the state of North Carolina. The improvement began four years ago, when the Rutherfordton, N.C., school joined *HSTW* and began to examine where it was and where it needed to go.

"We were a good school, but we had room for improvement," said Jim Goode, chairman of the science department and site coordinator for *HSTW*.

The school-improvement committee looked at results of the *HSTW* Assessment in reading, mathematics and science; the *HSTW* teacher survey; the *HSTW* student follow-up study; and end-of-course tests required in North Carolina. The committee also considered how many students were taking Advanced Placement courses; scoring 3 or higher on AP exams; taking honors courses; and taking courses at the local community college while still in high school.

Rutherfordton-Spindale leaders based their improvement plan on the *HSTW* key practices. They used data to establish short-term and long-term objectives and developed strategies for meeting each one. Each strategy had a time line, a list of needed resources, and a list of staff members or departments responsible for implementing the strategy.

Four years ago, the school had many levels of academic courses, including five levels of English. Now there is one level of each course. (Honors and AP courses are available for students who want to advance even further.)

"We realized that some of our courses were designed to allow students to make good grades without mastering concepts," Goode said, "so we did away with such courses."

School leaders also increased graduation requirements to 28 credits — eight more than the North Carolina minimum.

Drawing on information from the *HSTW* teacher survey, the school strengthened staff development to include workshops on integrated academic and vocational studies, reading in the content areas, teaching and learning styles, mathematics across the curriculum, and writing across the curriculum. As part of professional development, teachers

observed other teachers in the classroom and developed activities to help students connect academic and vocational skills.

The academic departments used state end-of-course tests to adjust their course outlines and teaching methods. Vocational leaders upgraded courses and enrolled more students in vocational concentrations — from 62 in 1996 to 114 in 1998.

Data indicated that students could perform better if they had out-of-class learning opportunities. As a result, the school offers a learning center in the afternoons to help students catch up or make up work they miss; a computer lab that is open from 3 to 5 p.m.; and a tutoring center where English, mathematics, science and social studies teachers are available from 6 to 8 p.m. two nights a week. The media center is open from 6 to 8 p.m. on Mondays and from 3 to 8:30 p.m. on Thursdays for students to study and do research.

The 1,100 Rutherfordton-Spindale students have access to more than 300 computer stations, many of them hooked up to the Internet. Students can take computer courses at the school or the local community college.

The improvement effort at this school has yielded impressive results. Between 1996 and 1998, students' scores on the *HSTW* Assessment rose from 277 to 298 in reading, from 295 to 318 in mathematics, and from 291 to 312 in science. The 1998 mathematics and science scores exceeded the National Assessment of Educational Progress scores for academic students nationally.

The North Carolina Department of Public Instruction named Rutherfordton-Spindale High School an "exemplary school" based on improvement in its scores on end-of-course tests between 1997 and 1998. Teachers received bonuses for meeting — and exceeding by 10 percent — the state's expectations for improvement.

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Findings by technical assistance team lead to successful school improvement

When a *High Schools That Work* technical assistance team visited Talbot County Public Schools in Maryland in 1995, it identified five challenges:

- get all teachers to use integrated, applied strategies to engage students in learning;
- develop a comprehensive guidance system;
- expand career and technology programs;
- offer a structured system of work-based learning; and
- implement a program to incorporate writing throughout the curriculum.

The superintendent and the Board of Education took the challenges seriously and offered to support the high schools in meeting them. In the three years prior to the next technical-assistance visit in 1998, Talbot County leaders and teachers worked hard to tailor their school-improvement efforts to meet the challenges.

System leaders used a variety of methods to disseminate findings from the technical assistance team, including:

- making a full report to the Board of Education;
- giving copies of the report to the principals at Easton High School and St. Michael's High School and meeting with each of them to discuss specific challenges;
- having a focus group, which already met monthly, review the report and address the challenges;
- getting the *HSTW* committees at both high schools to begin working on school-based strategies and activities to address the challenges; and
- using the report in school-improvement planning meetings.

Just before the technical assistance visit in 1998, the school system generated a "site visit update report" to show Talbot County teachers and administrators what they had accomplished in three years. The report also updated the technical assistance team on what the school system had done to address the challenges.

The report outlined the major activities taken to address each challenge:

- **Instructional strategies** — Teachers participated in professional-development activities offered by the Maryland Department of Education, *High Schools That Work* and

other entities. Local staff-development workshops and curriculum-development workshops addressed specific needs outlined in the technical assistance report.

- **Guidance and advisement** — The school system developed and implemented a systemwide career-advisement program for students in grades six through 12, a one-day job-shadowing experience for all high school students, and a supervised internship program for 11th- and 12th-graders.
- **Career and technology programs** — Courses were upgraded to raise expectations and to provide more work-based learning opportunities for students. State-of-the-art technology labs were designed and installed.
- **Work-based learning** — More than 160 students now participate in work-based learning experiences each year; another 150 participate in structured internships. Business leaders support the career and technology programs by helping students understand the knowledge and skills required in the workplace.
- **Writing across the curriculum** — Eight faculty members have participated in summer courses in writing across the curriculum. All career and technology teachers have attended a one-day workshop and have agreed to incorporate reading and writing assignments into their courses each semester.

The school system's efforts to improve have paid off. Students' scores on the *High Schools That Work* Assessment rose significantly between 1996 and 1998 — from 268 to 291 in reading, from 279 to 304 in mathematics, and from 278 to 302 in science. The 1998 scores exceeded the *HSTW* goals in all three areas.

In 1998, 97 percent of students met the *HSTW*-recommended mathematics curriculum (up from 76 percent in 1996) and 87 percent met the *HSTW*-recommended science curriculum (up from 34 percent).

Eighty-six percent of teachers said they were encouraged to teach more rigorous content to career-bound students.

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